Network-attached upsampler/DAC, outboard clock & headphone amplifier
Made by: Data Conversion Systems Ltd, Cambs
Supplied by: dCS Ltd
Telephone: 01954 233950
Web: www.dcsltd.co.uk; www.absolutesounds.com
Prices: £11,750 (Network DAC), £6750 (Clock), £8400 (Headphone Amp)

AUDIO FILE

hi-fi news OUTSTANDING PRODUCT

dCS Lina system

Aimed at very high-end headphone users, dCS's Lina Network DAC, Master Clock and Headphone Amplifier might also be the ideal compact system front-end for audiophiles
Review: **Andrew Everard** & **Paul Miller** Lab: **Paul Miller**

Headphone use has changed in recent years, from something to be endured through necessity to its own subset of hi-fi listening, with no shortage of ambitious and upmarket hardware currently available. Now dCS is on that bandwagon, for while it's been busy launching its APEX DAC technology for its 'full-size' offerings [*HFN* Jun '22] it's also developed the Lina, which is not so much a headphone amp as a complete playback system.

The 'stack' comprises the £11,750 Lina Network DAC, £8400 Lina Headphone Amplifier and £6750 Lina Master Clock, all three units housed in identically sized casework of remarkable quality and weight. Each is just 22cm wide in its black machined aluminium housing, with the weight hovering around 7kg per box. The compact industrial design is something of a departure for dCS, with the Network DAC's front-panel dominated by a large display, and that of the Headphone Amplifier by a big volume control and an array of output sockets – a standard 6.35mm unbalanced, plus balanced XLRs for stereo and separate left and right channels.

YOU CAN GO YOUR OWN WAY...

Both the amp and DAC can be used in isolation if so desired, the latter offering single-ended and balanced (XLR) outs to run into any amplifier you wish. The Headphone Amplifier has matching analogue inputs, plus a buffered option with an extra gain stage that's a little easier to drive. Again, it could be fed from any analogue source. And the Master Clock with its oven-controlled crystal oscillators? Well, that's to be used with the Network DAC, but could be used with other equipment featuring 44.1kHz or 48kHz-centric word clock inputs.

The Lina Network DAC does what it says on the box: it has an Ethernet connection to link it to the outside Internet world, and can play from local network storage as well as online services including Deezer, Qobuz, Spotify, Tidal and Internet radio. It also supports Apple AirPlay 2 via that network connection, and is Roon-ready. The generous range of digital inputs includes a USB-B for computer connection, plus USB-A for storage devices up to a suggested 32GB. Legacy inputs include optical and four electrical – two S/PDIF and two AES/EBU on XLRs.

Depending on the input chosen, the Network DAC can handle file formats up to 384kHz/32-bit and DSD128, and offers selectable upsampling to DXD or DSD, plus a choice of two digital filters in PCM operation and four in DSD [see PM's boxout, p41]. There are also three crossfeed settings, achieved here in DSP rather than in the all-analogue Headphone Amplifier. The Network DAC has two extra RJ45 sockets to link all the units together for synchronised power on/off.

'The Mosaic app provides a smoother interface'

Streaming here is supported by the S800 platform from Vienna-based StreamUnlimited, dCS concentrating instead on the audio section of the Network DAC, which utilises its familiar RingDAC technology. The Lina unit runs the 'standard' iteration, rather than the new APEX RingDAC version rolling out across the company's other separates, but then the development of this headphone system predates its arrival. However, given the adaptable nature of dCS's designs, don't rule out the possibility of future upgrades... never say never!

ARTFUL CONTROL

Operation of the Network DAC is possible using third-party UPnP apps running on a smartphone or tablet, but the smoothest interface is provided by dCS's own Mosaic Control app [*HFN* Sep '19], available for iOS and Android. Not only does Mosaic allow the user to stream music from local and online sources, including Airable podcasts, it also lets you browse music across the range on offer, and handles configuration, setting and operation of the Lina devices. You can really dig deep into the Network DAC's settings via the app, including the selection of upsampling and filter modes. There are neat touches too, like the ability to reassign three shortcut buttons on the app's homescreen – for input, PCM filter and crossfeed settings – to functions you think you're going to use most.

Though the easiest approach is to use this 'stack' as a complete 'just add cans' system, the modular nature of the set-up almost demands one looks at the various components – and more specifically the network player/DAC and the headphone amplifier – as standalone units. After all, the former has the makings of an intriguing streaming solution, while the latter is interesting as dCS's first all-analogue amplification product. Until recently, it had the combined streamer/DAC/headphone amp market covered with its £17,750 Bartók [*HFN* May '19], elements of which seeded the Lina [see PM's Lab Report, p43].

RIGHT: Inside the Lina headphone amplifier with ALPs volume pot [top left], switched gain [centre right], op-amp ICs [top and right], eight pairs of surface mount transistors [centre] and two pairs of 8A (ON Semiconductor) bipolars per channel [left] in the output 'power amp'

LEFT: Milled alloy cases each include a screened toroidal PSU transformer. The DAC's glossy fascia/display has touch-sensitive 'buttons' for navigation but the dCS Mosaic app is slicker. Headphone amp [bottom] has 6.35mm, 4-pin XLR and dual 3-pin XLR outputs

SIMPLY IRRESISTIBLE

That temptation to consider the Lina units as separates as well as a system proved too hard to resist, with the result that, as well as extensive listening to the stack with a variety of headphones, the Lina Network DAC also saw service as a streaming front-end for my main system, in which role it proved itself to be highly accomplished.

As ever, the choice of filter setting when using the upsampling facility of ⇨

QUARTS INTO PINT POTS

It's easy to overlook that the Lina Headphone Amp is dCS's first 'all analogue' product, and one not short on bipolar silicon with its directly-switched and op-amp buffered inputs feeding a 20kohm ALPs volume control, also with its own IC op-amp gain stage. The main amp includes high/low gain (the two relays are visible in the centre of the pic, p40) preceding a host of discrete devices for the biasing and drive circuit, the latter feeding a beefy, complementary output. Switchmode regulation is employed for this main power amp with linear regulators for the input/line stages.

By contrast, the Lina Network DAC is a version of the Vivaldi/Bartók, production-engineered into a new form factor on a 'flex-ridged' PCB (multiple, ribbon-connected boards). The digital filters are all linear phase types, varying principally in tap/coefficient length, trading response and stopband (alias) rejection against distortion/ringing in the time domain. This includes those deployed in the Lina's 'DSD mode' where the processing is executed in LPCM before the resampling/format conversion to a single-bit DSD stream. For its flagship DACs, dCS offers a maximum of six digital filters and while the same underlying code is embedded into the Lina, only two of these are user-accessible as 'F1' and 'F2'. We've already explored these filters in our Lab Reports for the Vivaldi One [*HFN* Feb '18], Bartók [*HFN* May '19] and Vivaldi APEX [*HFN* Jun '22] – it seems the Lina's 'F1' is equivalent to the Vivaldi/Bartók 'F1' but the Lina's 'F2' is the Vivaldi/Bartók's slow roll-off linear phase 'F4'.

Possibly, dCS might choose to enable the Vivaldi/Bartók filters F2, F3, F5 (minimum phase) and F6 within the Lina at some future date, but that's just supposition on my part. Similarly, it could also update the RingDAC's mapping to align the Lina more closely with the latest APEX upgrades. None of this is a block to purchase *now* because any future revisions would be achieved 'over air' via the network. PM

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LEFT: The Lina network DAC employs a StreamUnlimited 800 series platform [right, sidewall]. More familiar, the 96 current sources (a 2x48 matrix) that comprise the RingDAC core [centre] are addressed via a Xilinx Artix-7 FPGA [lower left]. Note also the 48kHz/44.1kHz clocks [bottom]. Fully balanced, mixed op-amp analogue output [top] has its own regulated PSU

the Network DAC is going to be a matter of personal preference. After some experimentation I was unable to come up with a convincingly consistent preference but typically settled on F2 when using the DXD upsampling, before sticking to DSD conversion with the default F1.

Of rather more concern was that harnessing the Network DAC to the Master Clock failed to elicit any significant uplift to what was already a superb sound. Yes, perhaps there was a minimal increase in focus with the add-on clock in use, but the internal clocking of the DAC seemed already to be doing an excellent job…

> 'The tripping percussion was delivered impeccably'

But first the headphone experience, and whether playing DSD files from my NAS or simply streaming Internet radio, upsampling the 320kbps stream to DXD, the Lina system proved an exceptional listen, especially with highly revealing headphones like the Oppo PM-1 planar magnetics [*HFN* Jul '14]. Playing the recent Houston Symphony Orchestra/Orozco-Estrada 'EP' release of Leonard Bernstein's *West Side Story Suite* [Pentatone PTC5187014; DSD64], the combination of the clarity and the crispness of the Network DAC and the Headphone Amplifier's weight and punch proved both thrilling and totally compelling.

SETTING THE STAGE

There's some serious power here, even with demanding 'phones like the PM-1s, revealed in the great lyrical sweeps of the music and the taut rhythms of the 'Mambo' and 'Cha-Cha' sections. Dial in a little of the crossfeed available via the DAC, and it's possible to create a very 'un-headphone-like' sound, with all the spaciousness of listening to good speakers, from the slam of the rich bass to the sense of a soundstage spread before you.

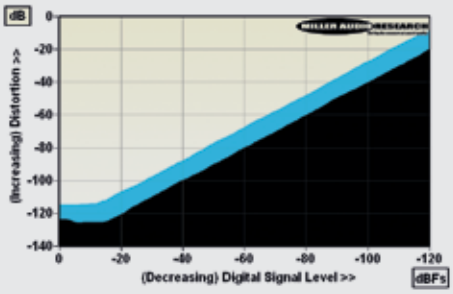
With the much more relaxed tones of the Philip Clouts Quartet's 'Nine Tales' from the 2010 *Sennen Cove* album [Point Records PCD025], there was a lovely sense of space and ease about the presentation via these dCS components, every note of Clouts' piano crystal-clear against the restrained bass and drums, while the sax had a solid presence amidst the soundstage. I came to this album having just heard a variation of this group from a front-row seat in a small jazz club, and the effect the Lina package delivered, whether

LAB REPORT

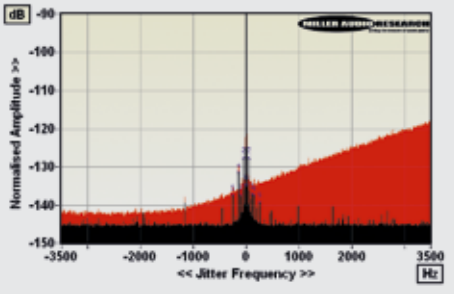
DCS LINA NETWORK DAC

There are four key variables in the Lina DAC's operation that need exploring, starting with the 0.2V, 0.6V, 2V and 6V output modes in the device settings menu. The latter pair amount to 2.05V and 5.91V, offering A-wtd S/N ratios of 109.1dB and 117.0dB, respectively, all from a usefully low 1.0ohm balanced source impedance. There's a little extra stress on the output at 6V so THD is just fractionally higher here at 0.0001-0.00025% [see Graph 1, below] vs. 0.00009-0.00017% at 2V output (all re. 0dBFs, 20Hz-20kHz), but this is of academic interest only. Distortion falls to a minimum of 0.00003% over the top 20dB of its dynamic range – lower than achieved in the dCS Bartók [*HFN* May '19] and jitter [see Graph 2] remains super-low at ~20psec.

Two digital filters come with the DXD upsampling mode in the processing menu, 'F1' being a steep roll-off linear phase type that offers a fine 123dB stopband rejection and very flat response of ±0.01dB/20Hz-20kHz with 48kHz media, extending to –0.1dB/40kHz with 96kHz files before cutting off slightly early to reach –22dB/45kHz. 'F2' is a slow roll-off linear phase filter with reduced time domain distortion (ringing) but also a reduced –7.3dB stopband rejection and increased aliasing IMD. It looks to be equivalent to 'Filter 4' in the dCS Bartók where the response also rolls away more 'softly' to –3dB/36kHz and –10.4dB/45kHz (96kHz media). With DSD64 resampling, the swell of ultrasonic requantisation noise is 'managed' in the Lina by four alternative filters, F1 to F4. These are all linear phase filters applied *before* DSD conversion with –3dB limits set at 78kHz, 68kHz, 64kHz and 28kHz, respectively. The impact of DSD resampling is easily illustrated by the 96kHz jitter spectrum [red trace, Graph 2]. **PM**



ABOVE: Distortion versus 48kHz/24-bit digital signal level over a 120dB dynamic range (black, 1kHz; blue, 20kHz). Note extended 0dB to –140dB Y scale



ABOVE: High resolution 96kHz/24-bit jitter spectrum with F1 filters (DXD upsampling, black; DSD, red)

HI-FI NEWS SPECIFICATIONS

Maximum output level / Impedance	5.89Vrms / ohm (XLR out)
A-wtd S/N ratio (USB / Network)	117.0dB / 117.1dB
Distortion (1kHz, 0dBFs/–30dBFs)	0.00011% / 0.00013%
Distortion & Noise (20kHz, 0dBFs/–30dBFs)	0.00025% / 0.00045%
Freq. resp. (20Hz-20kHz/45kHz/90kHz)	+0.0 to –0.0dB/–0.0dB/+0.0dB
Digital jitter (48kHz / 96kHz)	21psec / 10psec
Resolution (1kHz @ –100dBFs/–110dBFs)	±0.1dB / ±0.2dB
Power consumption	22W (1W standby)
Dimensions (WHD) / **Weight**	360x320x530mm / 9kg

LEFT: Lina DAC [top] includes LAN, USB-B and USB-A (DSD128/384kHz), dual-AES (384kHz), 2x coax (192kHz) and opt (96kHz) inputs. Analogue outs on XLRs and RCAs are joined by Word Clock inputs for connection to the Lina Master Clock [centre]. The Lina Headphone Amp [bottom] has direct (RCA/XLR) and buffered (XLR) inputs. All three Lina components may be sync'd via dCS's 'Power Link'

via headphones or with the Network DAC running into my amp and speakers, was entirely persuasive.

Not that you need to go for subtle jazz to hear the abilities of the Lina system in action. With the bombast of Muse's *Will Of The People* [Helium 3/Warner Bros 0190296383731], complete with operatic histrionics, buzz-saw guitars and pounding rhythm section, the sound was opened up wide for inspection. Without any restraint being applied, the touching 'Ghosts (How Can I Move On?)' and the driving 'Euphoria', with its charging synths and big choruses, blossomed into their own, distinctive acoustics.

UP TO SCRATCH

The Headphone Amp consistently delivered a big, bold high-energy sound entirely suited to the grand visions of Matt Bellamy's little band. However, just be careful with the volume control or your ears may well succumb to the fate promised in the final track!

Mind you, that focused sound was just as well suited to the skanking rhythm of Junior Murvin & Jah Lion's 'Police And Thieves' from Lee 'Scratch' Perry's *King Scratch* compilation [Trojan/BMG TJDCD605], the deep dub bass and tinkling, tripping percussion delivered impeccably to underpin the vocals.

What's more, with the Network DAC upscaling to DSD into my main system, even those live BBC Proms relays sounded suitably open and atmospheric. The BBC Symphony Orchestra performance of Holst's *The Planets* benefitted from the muscular delivery and tight handling of rhythms, while the ethereal sound of 'Neptune' – with the voices of the BBC Symphony Chorus fading into the Royal Albert Hall acoustic – luxuriated in the sheer resolution on offer here. It's a scintillating sound, whether played through a large system or – courtesy of BBC Sounds – experienced through the Headphone Amplifier.

HI-FI NEWS VERDICT

The price of the complete Lina stack is a head-turner, so it makes more sense if you view the components as separates, and build accordingly. The Network DAC is the star here, and will surely find a role in high-end streaming systems, while the Headphone Amplifier is mighty powerful, and will drive the most demanding of 'phones with real conviction. And the Master Clock? Well, you pays your money…

Sound Quality: 89%

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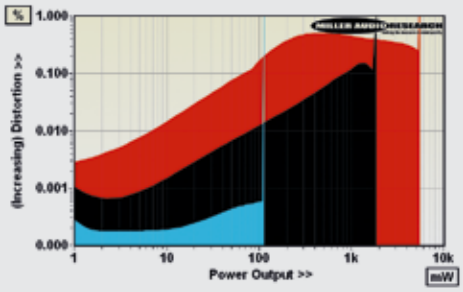
LAB REPORT

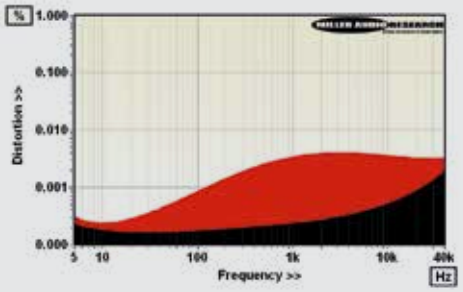
DCS LINA HEADPHONE AMP

While the Lina DAC clearly inherits a deal of technology from the Bartók [*HFN* May '19], the Lina Headphone Amplifier is substantially more capable than the Bartók's integrated Class A preamp. There is some commonality, including the usefully low ~0.7ohm single-ended output impedance, but this is a function of good design practice as much as shared topology. Either way, it ensures there's a minimal 0.16dB signal loss into a 32ohm headphone load with a similar resilience over the system (amp/headphone) frequency response. The Headphone Amplifier's native response is almost unaffected by loading, running flat to within a tight ±0.1dB (20Hz-20kHz), falling slightly thereafter to –2dB/100kHz, while the residual noise is low at –90dBV and the A-wtd S/N a solid 96.2dB (re. 0dBV) via the SE output.

Distortion *is* influenced by loading, however, from a mere 0.00007-0.0005% (20Hz-20kHz) into high impedance loads to a slightly higher (but not 'high') 0.0003-0.004% at 10mW/32ohm via the SE output [red trace, Graph 2 below]. Two levels of gain are offered, amounting to +0.6dB (Low) and +11dB (High) via the standard XLR input. Input headroom is in excess of 12V, but the gain settings do influence the Lina's maximum output which is 760mW/32ohm in 'Low' and 1850mW/32ohm (1.85W) in the 'High' setting. Maximum output into high 600ohm headphones is 110mW while the complementary power amp [see pic, p43] has sufficient current to support a huge 5.4W into very low 8ohm loads [see Graph 1]. This Graph also confirms the steady increase in distortion when driving lower loads from 0.0002%/10mW/600ohm to 0.0015%/10mW/32ohm and 0.015%/10mW/8ohm [blue, black, red traces, respectively], though these figures are still well below that of a typical headphone. **PM**



ABOVE: Power output vs. THD into 600ohm (blue), 32ohm (black) and low 8ohm (red) headphone loads



ABOVE: Distortion versus frequency from 5Hz-40kHz (0.6V unloaded, black; 10mW/32ohm, red)

HI-FI NEWS SPECIFICATIONS

Maximum output (<1% THD) / **Gain**(s)	8.4V (SE) / +0.6dB / +11dB
Power output (<1% THD, 600/32/8ohm)	110mW / 1850mW / 5400mW
Output Impedance (20Hz-20kHz)	650-730mohm
A-wtd S/N ratio (re. 0dBV/32ohm)	96.2dB / 95.9dB
Distortion (20Hz-20kHz, 0dBV)	0.00007–0.0005%
Distortion (20Hz-20kHz, 10mW/32ohm)	0.0003–0.004%
Freq. resp. (20Hz-20kHz/100kHz)	+0.0 to –0.1dB/–1.95dB
Power consumption	8W (1W standby)
Dimensions (WHD) / **Weight**	360x320x530mm / 9kg